

Background

The education of Utah students in science, technology, engineering, and mathematics (STEM) is critical to our continuing economic growth. Recent studies such as *Rising Above the Gathering Storm* and *Keeping America Competitive* highlight the challenge of increasing student interest in mathematics and science. A *National Action Plan for Addressing the Critical needs of the U.S. Science, Technology, Engineering, and Mathematics Education System*, recently released in draft form by the National Science Board, outlines a national strategy for improving STEM education.

To succeed in an information-based, highly technological society, students must develop skill in STEM fields. As technology and science advance, students must be capable in mathematics and science at level beyond that required in the past. Teacher quality, public perception, and student interest intersect in mathematics and science classrooms in ways that lead to increased student learning and excitement for pursuing STEM studies. Increased attention to and funding for these areas is a critical component to improving the mathematics and science education pipeline which leads students to a lifetime of contribution in STEM fields.

The USTAR system is a proposal that would identify K-16 systems for STEM enhancement. Each USTAR system will consist of a single high-school along with all of its feeder schools and a partner from higher education. The USTAR systems will be funded at increased levels to provide year-round contracts for mathematics and science teachers. These systems will purchase technology and materials to enhance STEM classrooms, provide additional professional development to their teachers, enhance opportunities for students to study mathematics and science in and outside of the classroom, open their doors to other faculties who wish to model their successes, and improve public value for STEM studies through their efforts. Through on-going and increasing funding, USTAR systems will be established throughout the State of Utah.

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Goal

1. Fostering earlier student involvement and interest in STEM education and STEM fields
2. Increasing the numbers of students taking 4 years of mathematics and science.
3. Sufficient number of successful students pursuing STEM careers to meet economic needs

Challenges

Elementary:

- Teachers with sufficient content knowledge to be confident in teaching mathematics and science
- Sufficient time spent on science in the elementary classroom

Middle School:

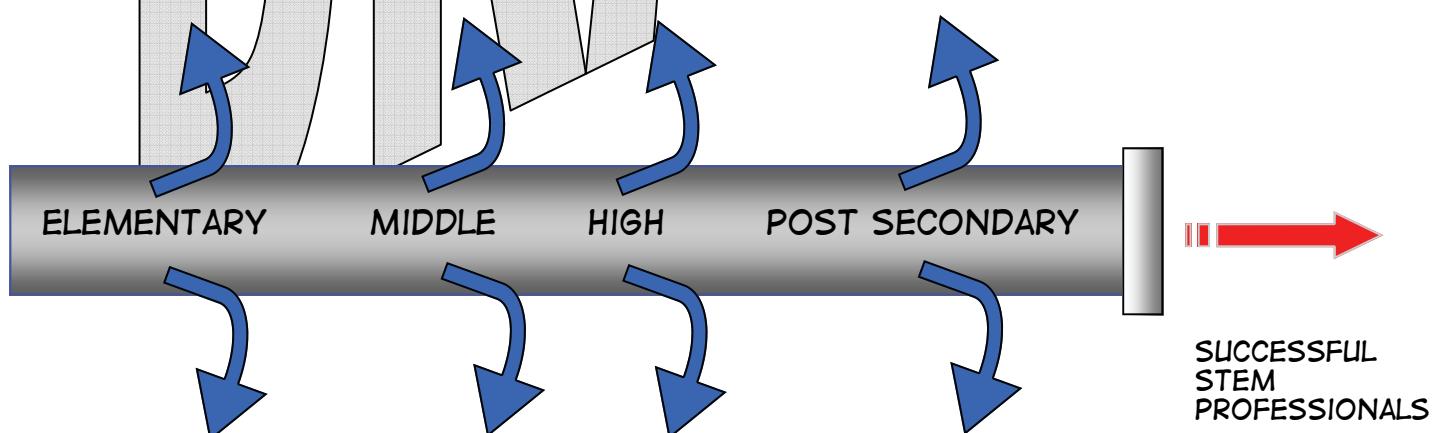
- Resources for authentic hands-on learning experiences
- A positive first experience for students in abstract reasoning
- Opportunities for exposure to STEM outside of the classroom to develop a positive disposition towards math and science.

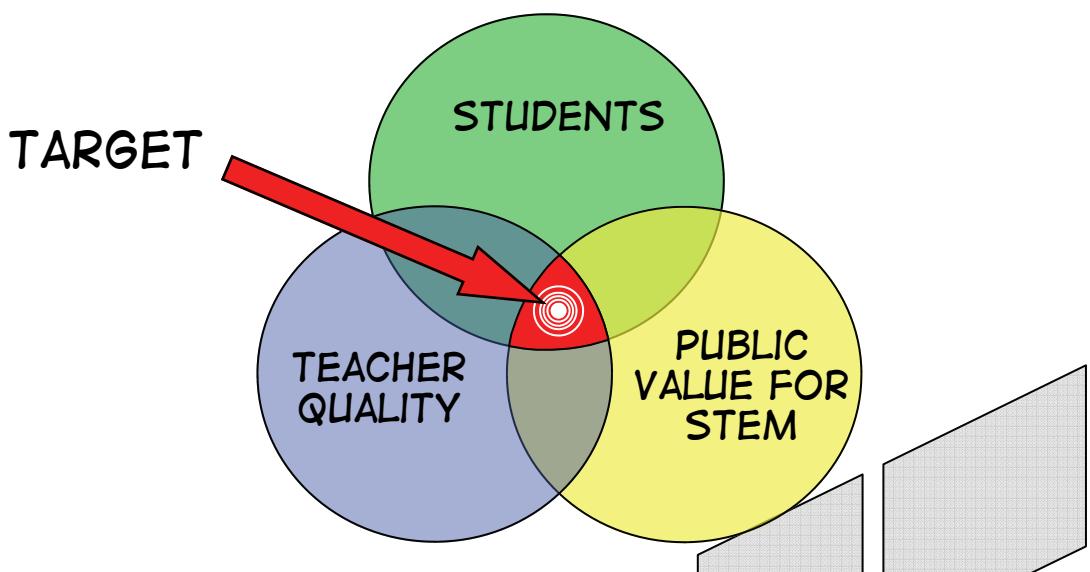
High School:

- Students with persistence to learn difficult material
- Students encouraged to enroll in 4 years of math and science
- Understanding the value of STEM subjects

Accountability:

- Significantly more students taking 4 years of math and science in high school
- Significantly more students pursuing post secondary STEM education
- Sufficient STEM professionals to meet economic needs





	USTAR School System Goals	Mechanisms
Teacher Quality		
Have highly qualified teachers in every mathematics and science classroom.	<ul style="list-style-type: none"> Hire highly qualified teachers in every mathematics and science classroom Assign teachers according to their expertise 	
Provide on-going professional development based on current research.	<ul style="list-style-type: none"> Provide opportunities for teachers to participate in authentic STEM research, such as participating in summer research projects with universities Provide opportunities for teachers to participate in STEM education research, such as opening their classrooms as lab-classrooms Provide opportunities for teachers to increase content knowledge in STEM subjects. 	
Provide resources to increase STEM teacher compensation	<ul style="list-style-type: none"> Establish 12 month contracts that engage STEM teachers in summer professional development programs, research experiences, and applied STEM experiences 	
Establish a K-16 vertical articulation team	<ul style="list-style-type: none"> Build professional development partnerships with elementary, secondary and post secondary institutions within the system Establish monthly K-16 collaboration time for STEM teachers Establish a council composed of community members, business partners, university representatives, and participating school administration, counselors and other faculty members 	
Support research on learning and educational practices and the development of instructional materials	<ul style="list-style-type: none"> Broker ideas to other school systems by posting web-based lessons, Open classrooms as educational labs Host professional development opportunities 	

	USTAR School System Goals	Mechanisms
Student Interest	Foster early student involvement and interest in STEM education and STEM fields	<ul style="list-style-type: none"> • Allocate time for science exploration in elementary schools • Involve young students in science fairs
	Significantly increase the numbers of students taking 4 years of mathematics and science	<ul style="list-style-type: none"> • Provide sufficient course offerings in high schools to encourage enrollment • Create an awareness of scholarship opportunities for students that pursue mathematics and science
	Use technology and materials in authentic, hands on learning experiences	<ul style="list-style-type: none"> • Create new environments for learning such as internet based lessons, wikis, or podcasts • Acquire technology and materials to implement authentic, hands on learning experiences • Use technology for data collection and analysis in authentic field experiences
	Provide opportunities for student engagement outside of regular classroom experiences	<ul style="list-style-type: none"> • Sponsor summer enrichment mathematics/science camps • Form partnerships with universities that involve students in research • Develop partnerships with businesses to create new STEM extra curricular opportunities • Create after school clubs that focus on mathematics/science
	Create a unified vision and value of STEM education	<ul style="list-style-type: none"> • Involve administrators and other faculty members from all USTAR system schools in STEM professional development • Provide opportunities for involvement with the broader scientific and business community • Involve all faculty members in creating a STEM vision • Increase administrative support for improving STEM education and increasing STEM enrollment
	Increase public appreciation for and understanding of STEM	<ul style="list-style-type: none"> • Facilitate a media campaign highlighting achievements in STEM school systems • Increase awareness of and promote STEM careers • Host career day with parent involvement • Showcase student work and importance of mathematics and science education at parent nights

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